CHAPTER 5B

WELDING

5B-01. GENERAL

a. This chapter covers welding and the inspectors* duties in the inspection of welding. Data and information presented herein apply to structural, piping and plate materials; to all types of ferrous and non-ferrous materials; and to welding processes, gas or electric, associated with Corps of Engineers* contracts.

b. It is recognized that welding is a specialized subject. The checklist items that follow will assist the general inspector in his duties; make him aware of possible poor quality workmanship, and show the need for promptly requesting technical assistance from a qualified welding specialist on questionable items.

c. The general inspector should have a complete, basic knowledge of welding methods, practices, and procedures. His inspection of welding should assure that quality welding is being obtained.

d. Welding and cutting is still the greatest single cause of fire on construction projects. Large fire losses are very common. The continuous occurrence of small fires and the presence of charred combustible material is indisputable evidence of improper and uncontrolled welding procedures and operations. Prior to approval of welding operations, combustible material must be removed or adequately protected. Combustible material such as low density fiber board, bituminous and plastic products, saturated products including vapor barriers, flammable liquids and vapors including paints, varnishes, petroleum, and other materials with high flame spread characteristics if ignited cannot be controlled by first aid fire fighting equipment. Fire prevention and control must be a primary consideration on all welding operations.

e. Since there is no craft designation of “welder” in the construction industry, all crafts perform the welding on their own work. This condition makes it difficult to get skilled welders on a project, and rigid qualifications are necessary.

5B-02. GENERAL REQUIREMENTS

Prior to welding:

a. Check whether welding procedure specifications have been submitted and approved. You should have in hand the approved procedure specifications, in the format required by Appendix E., AWS D1.1. This specification guides your checking of material, process, position, rod specification and classification, Number of passes, current polarity, and other information needed by you.

b. Check welder certification. It must be submitted and approved prior to welding. The identifying mark that each welder will be using to identify his work should be checked against his certification. The certification must state that he is qualified

to weld as the procedure dictates. His qualification test result, represented by the certification, must be available from the contractor.

5B-03. DETAIL REQUIREMENTS

Welding Sequence and Procedure Drawings:

a. Check for excessive distortion. Lay welds in a prearranged pattern.

b. Check approved shop drawings against contract drawings,noting discrepancies and advising supervisor.

c. Check weld symbols. Interpret correctly.

d. Check placement of welds in designated sequence. Do not permit deviations.

5B-04. INSPECTION PROCEDURE

a. General

(1) Be sure that a copy of the American Welding Society "Structural Welding Code" (AWS) D1.1 is available for your use. you should become familiar with Section 6, Inspection, which has been completely rewritten in the 1980 Code.

(2) Insure that the approved welding procedure is adhered to.

b. Specific

(1) Process

(a) Identify welding process used, i.e.,gas welding or metal arc welding.

(b) Check welding procedure specification for agreement as to correct process to be used.

(c) Carefully inspect the welding of the metals. Watch for burns.

(2) Base Metal

Check mill reports to see that necessary approval action has been taken on material prior to job fabrication.

(3) Filler Metal

(a) Look at container or color coding of electrodes (welding rods) for classification.

(b) Reject all coated electrodes that have been wet or on which the coating has been damaged.

(c) Low hydrogen covered electrodes require special handling, drying and storage. Read paragraph 4.5 of the AWS Structural Welding Code.

(d) Check diameter of electrodes.

(4) Position — Ensure that no welder is welding in any position other than that for which he has been qualified.

(5) Preparation of Base Metal — Observe the joint preparation prior to welding.

(a) See that method of cutting bevel ensures parallel surfaces.

(b) Do not allow torch cutting unless special permission has been received.

(c) Inspect surfaces for removal of all dirt, grease,loose scale, slag, or rust.

(d) Examine weld joint for root opening, bevel angle, root face, and groove face.

(e) Verify alignment of material.

(f) Determine allowable tolerances.

(6) Nature of Current (Arc Welding Only)

(a) Check polarity if D.C. current is being used. Either straight polarity or reversed polarity may be used, depending on material welded and electrode used. Check approved welding procedure.

1. Check positive and negative leads at welding machine.

2. Use plates 1 and 2 to identify type of polarity (pages 5B-7 and 5B-8)

(b) Check frequency shown on nameplate if alternating current welders are used.

1. Does it agree with frequency shown on approved welding procedure schedule?

2. Require identical frequencies.

(7) Size of Welding Tips (Gas Welding Only). Check tip size.

(8) Nature of Flame (Gas Welding Only)

(a) Check flame adjustments.

(b) Check welder*s adjustment for application (reducing,oxidizing or neutral).

(9) Method of Welding (Gas Welding Only) . Check method of welding to be used (forehand or backhand)

(10) welding Technique.

Check actual technique being used.

(a) Examine current and voltage-dial readings at which pointers have been set on welding machine. Require measurement by instruments.

(b) Identify number of passes or heads placed.

(c) Determine diameter size of electrode used for each pass of weld material placed.

(d) Ensure that all welds are quality welds, that techniques are such that there is no excessive weld pileups or spatter, no irregular weld contours, no undercut or no off—center welds.

(11) Cleaning - See that all slag or flux is removed before laying down the next successive weld bead.

(12) Defects - Check welding against method noted on welding procedure specifications.

(a) Insure that defects are ground, chipped or chiselled back to sound metal with no irregular edges or areas of stress concentration.

(b) Observe that metal is not rolled over a defect.

(c) Inspect for surface cracks in critical areas by magnetic particle tasting.

(13) Peening - Check degree of peening permitted and the suggested or approved types of tests.

(14) Treatment of Underside of Weld Groove - Check detail and sketches noted on welding procedure specifications.

(15) Preheating

(a) Check requirements.

(b) Check methods of control.

(16) Check to see that all weld flux, slag and spatter is completely removed.

(17) Be sure each welder identifies his work by stamping his mark near each weld.

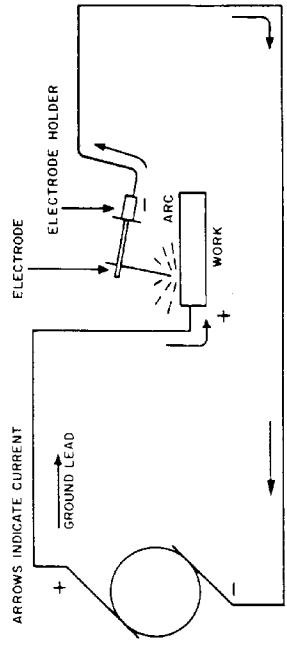
ELECTRODE HOLDER
ELECTRODE
ARC
WORK
STRAIGHT POLARITY
ARROWS INDICATE CURRENT
GROUND LEAD
+
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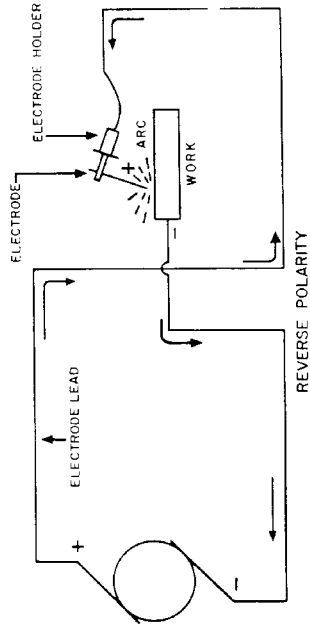
PLATE I


ELECTRODE HOLDER
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